

Claims

1. A fluidized bed reactor (10), comprising:
- a furnace (16), having a bed of particulate material
 - 5 and a bottom (24) provided with nozzles (26) for fluidizing gas, said bottom limiting the furnace from the bottom;
 - a heat exchange chamber (40) provided with heat exchange surfaces (48) for recovering heat from the
 - 10 particulate material; and
 - a discharge channel (52) connected to the lower part of the heat exchange chamber for removing particulate material from the heat exchange chamber (40) to the furnace (16);
- 15 **characterized** in that the fluidized bed reactor (10) comprises a substantially vertical auxiliary channel (62) for transferring particulate material from the heat exchange chamber (40) to the furnace (16) and from the furnace (16) to the heat
- 20 exchange chamber (40), the lower part of the auxiliary channel (62) being provided with nozzles (68) for fluidizing gas and with a flow conduit (64) for connecting the auxiliary channel to the furnace (16), and the upper part of the auxiliary channel (62) being
- 25 provided with a flow conduit (66) for connecting the auxiliary channel (62) to the heat exchange chamber (40).
2. Fluidized bed reactor in accordance with claim 1, **characterized** in that the discharge channel (52) is
- 30 substantially vertical, the lower part of the discharge channel is provided with nozzles for fluidizing gas (58) and the lower part of the discharge channel is provided with a flow conduit (50) for connecting the heat exchange chamber (40) to the discharge channel (52) and the upper
- 35 part with a flow conduit (60) for connecting the discharge channel (52) to the furnace (16).

3. Fluidized bed reactor in accordance with claim 2,
characterized in that the furnace (16), the heat exchange
chamber (40), the discharge channel (52) and the
auxiliary channel (62) form an integrated structure,
5 having the discharge channel (52) and the auxiliary
channel (62) adjacently arranged between the furnace (16)
and the heat exchange chamber (40).

4. Fluidized bed reactor in accordance with claim 2,
10 characterized in that the reactor (10) comprises two
discharge channels (52), and the auxiliary channel (62)
is arranged between the two discharge channels.

5. Fluidized bed reactor in accordance with claim 2,
15 characterized in that the discharge channel (52) and the
auxiliary channel (62) are at least partially at the same
height level.

6. Fluidized bed reactor in accordance with claim 5,
20 characterized in that the flow conduit (66) in the upper
part of the auxiliary channel (62) is at most at an about
500 mm higher height level than the flow conduit (60) in
the upper part of the discharge channel (52).

25 7. Fluidized bed reactor in accordance with claim 6,
characterized in that the flow conduit (66) in the upper
part of the auxiliary channel (62) is at most at an about
300 mm higher height level than the flow conduit (60) in
the upper part of the discharge channel (52).

30 8. Fluidized bed reactor in accordance with claim 2,
characterized in that the flow conduit (64) in the lower
part of the auxiliary channel (62) is at a higher height
level than the flow conduit (50) in the lower part of the
35 discharge channel (52).

9. Fluidized bed reactor in accordance with claim 1,

characterized in that the flow conduit (64) in the lower part of the auxiliary channel (62) is at an at least 200 mm higher height level than the bottom (24) of the furnace.

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10. Fluidized bed reactor in accordance with claim 1, characterized in that the lower part of the auxiliary channel (62) is at the level of the bottom (24) of the furnace and the flow conduit (64) in the lower part of the auxiliary channel comprises nozzles (86) for fluidizing gas, which nozzles direct fluidizing gas towards the furnace (16).

11. Fluidized bed reactor in accordance with claim 1, characterized in that the flow conduit (64) in the lower part of the auxiliary channel (62) is provided with step grid nozzles (86).

12. Fluidized bed reactor in accordance with claim 1, characterized in that nozzles for fluidizing gas are arranged at different height levels of the auxiliary channel (62).

13. Fluidized bed reactor in accordance with claim 1, characterized in that the reactor comprises means (70) for measuring the temperature of the furnace (16), heat exchange chamber (40) or the discharge channel (52) or of the particulate material in one of them or of the heat exchange medium flown through the heat exchange surfaces (48) arranged in the heat exchange chamber, and means for adjusting the flow velocity of the fluidizing gas to be fed to the lower part of the auxiliary channel (62) based on the measured temperature.

14. Fluidized bed reactor in accordance with claim 1, characterized in that the heat exchange chamber (40) comprises first means (72, 30, 36) for feeding

particulate material from the fluidized bed reactor to the heat exchange chamber (40).

15. Fluidized bed reactor in accordance with claim 14,
5 characterized in that the furnace (16) and the heat exchange chamber (40) have a common wall part (14a) and the first means for feeding particulate material to the heat exchange chamber (40) comprise at least one opening (72) in the common wall part (14a).

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16. Fluidized bed reactor in accordance with claim 14,
characterized in that the fluidized bed reactor (10) is a circulating fluidized bed reactor, the upper part of which furnace is provided with a discharge opening (28)
15 for the discharge of exhaust gases and particulates entrained therewith from the furnace (16), and the first means for feeding particulate material to the heat exchange chamber (40) comprise a separator (30) for separating particles from the exhaust gases of the
20 furnace, and a return duct (36) for guiding at least a portion of the separated particles to the heat exchange chamber (40).

17. A method of recovering heat in a fluidized bed
25 reactor (10), said method comprising the steps of:
(a) feeding carbonaceous fuel (18) and oxygenous fluidizing gas (20) to a furnace of the reactor;
(b) feeding hot bed material particles from the furnace (16) to the upper part of a heat exchange chamber
30 (40);
(c) recovering heat from the hot bed material particles in the heat exchange chamber (40), whereby cooled bed material particles are produced;
(d) discharging cooled bed material particles from the
35 lower part of the heat exchange chamber (40);
characterized in that the method comprises a step of:
(e) discharging hot bed material particles in a first

operational state of the fluidized bed reactor (10) as an overflow from the upper part of the heat exchange chamber to the furnace downwards along a substantially vertical auxiliary channel (62) and transferring in a second operational state of the fluidized bed reactor (10) hot bed material particles by means of fluidizing gas fed to the lower part of the auxiliary channel (62) from the furnace (16) to the heat exchange chamber (40) upwards along the substantially vertical auxiliary channel (62).

18. Method in accordance with claim 17, **characterized** in that the amount of hot bed material transferred from the furnace (16) to the heat exchange chamber is adjusted by altering the amount of the fluidizing gas fed to the lower part of the auxiliary channel (62).

19. Method in accordance with claim 18, **characterized** in that the method comprises a step of:

(f) measuring the temperature of the furnace (16), the heat exchange chamber (40) or the discharge channel (52) or the material in one of them or the temperature of heat exchange medium flown through heat exchange surfaces (48) arranged in the heat exchange chamber, and adjusting the amount of fluidizing gas fed to the lower part of the auxiliary channel in step (e) based on the temperature measured in step (f).

20. Method in accordance with claim 17, **characterized** in that at high loads of the fluidized bed reactor, hot bed material particles are discharged as an overflow from the upper part of the heat exchange chamber (40) downwards along the substantially vertical auxiliary channel (62) and at low loads of the fluidized bed reactor hot bed material particles are transferred by means of fluidizing

gas fed to the lower part of the auxiliary channel (62) from the furnace (16) to the heat exchange chamber upwards along the substantially vertical auxiliary channel (62).

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21. Method in accordance with claim 17, characterized in that the fluidized bed reactor (10) is a circulating fluidized bed reactor and step (b) is carried out by feeding particles separated by a separator (30) of the hot circulation of the circulating fluidized bed reactor to the heat exchange chamber (40).

22. Method in accordance with claim 17, characterized in that step (b) takes place by feeding particulate material directly from the furnace (16) to the heat exchange chamber (40) through an opening (72) in the common wall part (14a) thereof.

23. Method in accordance with claim 17, characterized in that in the second operational state in step (e) fluidizing gas is fed to the auxiliary channel (62) at more than one height level.

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